International Research Journal of Engineering, IT & Scientific Research
Available online at https://sloap.org/journals/index.php/irjeis/
Vol. 3 No. 4, July 2017, pages: 27~36
ISSN: 2454-2261
https://sloap.org/journals/index.php/irjeis/article/view/548

Problems Faced by Teachers in Designing and Implementing Authentic Assessment in Science Teaching

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Article history:

Received: 9 March 2016
Accepted: 30 May 2017
Published: 31 July 2017

Keywords:

authentic assessment;
instrument use;
problem faced;
science teaching;
teacher;

Abstract

This study was aimed at identifying the problems faced by the teachers in designing and implementing authentic assessment in science for Junior High School and Senior High School in Bali. The sample consisted of 73 teachers of Junior and Senior High School in Bali. The instrument used to collect the data in this study was a questionnaire. The results of the questionnaire were followed up with Focus Group Discussion (FGD) by involving selected teachers. The data were analyzed descriptively. The results show that 1) there is a lack of understanding about NOS and its implication in science teaching, 2) limited understanding on the part of the teachers about authentic assessment, 3) lack of science laboratory facilities to support practicum/inquiry activities, and 4) lack of internal and external supervision related to authentic assessment. The implications from this study are (1) teachers need to be given an intensive training related to the designing and implementation of authentic assessment both by the schools and other institutions such as LPMP, LPTK, and other offices; 2) quantity and quality of science laboratory facilities need to be improved; 3) the number of the students in the classroom should be adjusted to the standard of teaching and learning process (maximum 32 students).

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1. Introduction

The still low quality of human resources in Indonesia is still the object of discussion in mass media. The President of the Republik of Indonesia, Joko Widodo states that human resource development is important in ushering the era of competition among nations. He stresses the need for "extensive overhauling " of education quality (Bali Post, 6 October 2016: p.1). improvement of education quality to produce better human resources cannot

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be separated from various aspects such as curriculum teachers, infrastructure and facilities, and instruction as well as assessment. In the context of teaching and assessment, Harlen (1992) states that assessment is an integral part of teaching. Furthermore, Marzano *et al.,* (1994) state that assessment is an integral part of an instruction.Furthermore, Marzano, *et al.,* (1994) affirm that there is a strong relationship between science assessment and science teaching. The five instructional dimensions which are closely related are (1) positive attitude and perception toward knowledge, (2) acquisition and integration of knowledge, (3) extension and deepening of knowledge, (4) use of knowledge meaningfully, and (5) positive thinking habit.

The use of the standard test to measure learning achievement tends to stress the cognitive domain. This condition has narrowed the meaning of education into the process of knowledge transfer. Besides, many references reveal the use of multiple choice standard test (Simmons & Resnik, in Garcia & Pearson, 1993: 337). The use of multiple choice model test stresses the large-scale evaluation administration and rules out real classroom teaching and learning interactions as the consequence, the teacher feels it less important to develop other potentials of the students, both those which are covered by the affective domain and those that are covered by the psychomotor domain.

The putting into effect the 2013 Curriculum brings about the consequence of the change in the assessment system. In the 2013 Curriculum, the assessment of learning achievement covers the competencies of attitude, knowledge, and skill which are done in balance. One of the assessments stressed in the 2013 Curriculum is authentic assessment, that is a form of comprehensive assessment which is done by teachers continually. (Regulation of Ministry of National Education No, 104 of 2014). However, in reality, the teacher faces difficulties in doing an authentic assessment. One of the causes of the postponement of the implementation of the curriculum is the fact that there are many teachers who have not been able to identify the aspects of authentic assessment and have not been able to do the assessment required by the 2013 Curriculum.

Many outcomes are beneficial but are not measurable by a test, and the most frequent use of "paper and pencil" form of test encourages the teachers to adopt the term assessment in the world of education.The word assets come from French "aside," which means to 'sit beside'. It means that the teacher always sits beside the student to know his or her development from a close distance. Considering the broad scope of assessment, it is appropriate if we see the teaching and assessment as two sides of a coin, the one complements the other (National Research Council, 1996:76). The assessment covers all forms of measurement done by the teacher so that it also covers conventional tests. In relation to the education world, assessment is seen as a formal effort to determine the status of the student based on certain variables which are known as variables of interest (Popham,1995). The working definition gives a more accurate definition of the status of the student, viewed from knowledge, skills, and attitudes.However, an obscured understanding often occurs between assessment and evaluation. In the following part the concept of assessment is explained and its difference from evaluation. Assessment is defined as the collection of information, both quantitative and qualitative, through various tests, observation, and other techniques used to determine an individual, group or program performance (Doran *et al.,* in Gabel, 1994: 388). In science education, the scope of assessment covers knowledge of facts and concepts of science, science process skill, scientific thinking, and problem-solving skill, skill to use laboratory equipment and the tendency to apply scientific knowledge and skill (Raizen, *et al.,* 1991; Swain, in Gabel, 1994). The target of the students' achievement which will be measured by assessment consists of knowledge, reasoning, skills, products, affection. The five targets enable the measurement of assessment methods, such as selected response, essay, performance assessment, and personal communication. If the targets have been formulated correctly and clearly, there will be various benefits which can be gained, for example, teacher's accountability can be stated more firmly, the students will understand their responsibility clearly, and teacher's workload can be managed better (Stiggins, 1994). To differentiate formal tests from assessment, then various nonformal labels of assessment according to their targets, for example: performance assessment, which gives more emphasis on process than product; alternative assessment, which does not follow the formal convention of assessment ;authentic assessment, which puts more stress on daily tasks; portfolio assessment, developed to filter the student's assessment systematically in the learning process ; and assessment by exhibition, which stresses on the use of portfolio and performance as the key to the success of the assessment system (Garcia, 1993: 355-356). If the teacher is well-versed in assessment, he or she will contribute positively, for example, he or she will overcome the weaknesses of the standard test which is less comprehensive in assessing the target of achievement; he or she will be able to assess on a continual basis, he or she will be efficient in time and cost, able to empower teachers and students, the students will understand the criteria of assessment which will be used to assess them and will be actively involved in assessing him/herself and other students, and the results of the assessment will be followed up soon (Stiggins, 1994). In order for the assessment to proceed well, teachers need to be guided by basic principles of assessment (Stiggins, 1994: 9-15). The result of assessment can be used to diagnose the strengths and weakness of

the students, to monitor their progress, to determine their ranking, and to determine the effectiveness of the instruction done by the teacher. Furthermore, today every teacher is also required to understand more deeply three things that are related to assessment and its result, i.e.,the result of an assessment determines the perception of the people about the effectiveness of education, the need to promote the use of performance assessment as part of the education process, and the use of assessment instruments as the means to clarify instructional objectives which will finally be used to improve the quality of education (Popham, 1995).

The process of assessment is so important in education, especially in science teaching at a school that there is a need to do a research on why authentic assessment has not been optimally implemented at the school. Based on the background above, the problems that are going to be answered are (1) what do the teachers understand the nature of science, authentic assessment, and their implications on the implementation of authentic assessment at school, (2) how has the authentic assessment been implemented so far by the teachers, and (4) what efforts have to be done to overcome problems faced in implementing authentic assessment in science teaching at school.

2. Materials and Methods

This study was a survey with the aim of analyzing the teachers' difficulties in designing and implementing authentic assessment in teaching science at junior high schools and senior high schools. The study involved 73 junior and senior high school science teachers as respondents who came from different places all over Bali. The instrument used was questionnaire which covers the aspects of the nature of science, and science teaching, the nature of assessment and authentic assessment, various types of authentic assessment in Science teaching, the support in designing and implementing authentic assessment, and assessment management. Other instruments used were interview guide to trace further the view of the principals and teachers about authentic assessment. To sharpen the accuracy of data, then a focus group discussion (FGD) was done involving 25 Science teachers of the junior high school and senior high schools and lecturers. The data were analyzed descriptively and qualitatively.

3. Results and Discussions

3.1 Results

Based on the result of the study on the need to develop authentic assessment in Science teaching at junior high schools and senior high schools with a sample of 73 junior and senior high school teachers who came from different places all over Bali, the following data were obtained.

(1) Description of teachers' understanding of the nature of science (NOS) and its implication on Science teaching

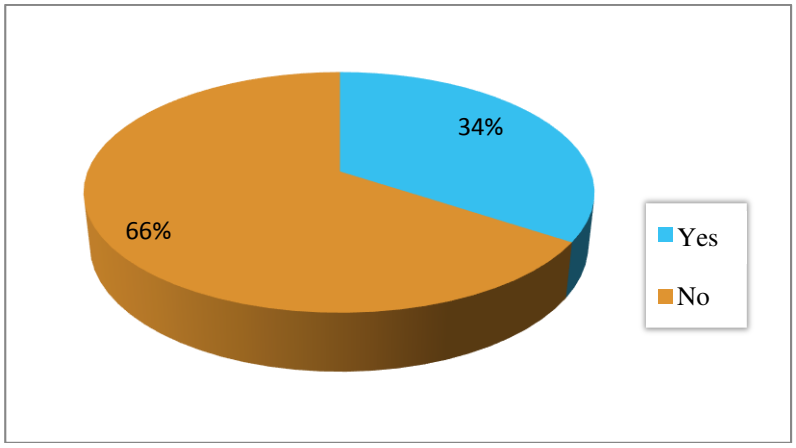

Figure.1 Teachers' understanding about the nature of Science and its implication on Science teaching

From Fig. 1 it is seen that the percentage of teachers who understand the nature of science is 34%, while 66% of them do not understand the nature of science and its implication on Science teaching correctly. This indicates that most junior and senior high school Science teachers (66%) do not have insights and knowledge about NOS.

Science Teachers' understanding about authentic assessment in Science teaching

Based on the result of analysis of the teachers' understanding of authentic assessment the data as shown in Fig. 2 were found.

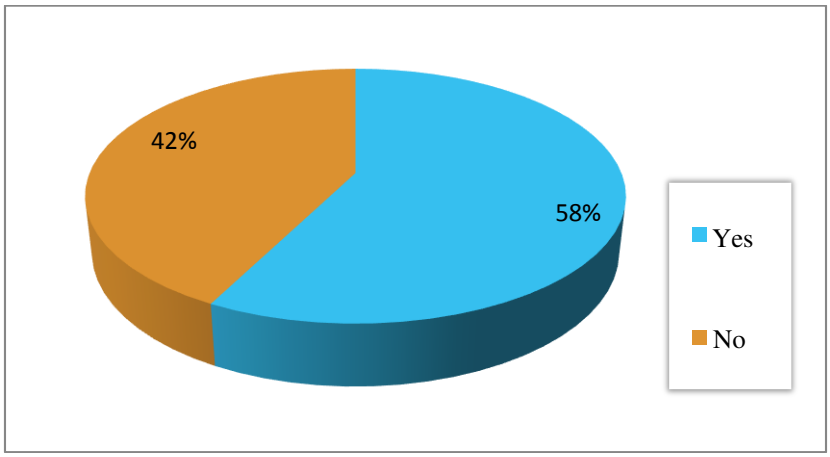

Figure 2. Teachers' understanding of authentic assessment in Science teaching

Based on Figure 2, it is seen that the percentage of teachers who understand correctly about authentic assessment in Science teaching is 58%, while 42% have a poor/wrong understanding about authentic assessment in Science teaching, the distribution of the types of assessment that they know is as shown in the graph below.

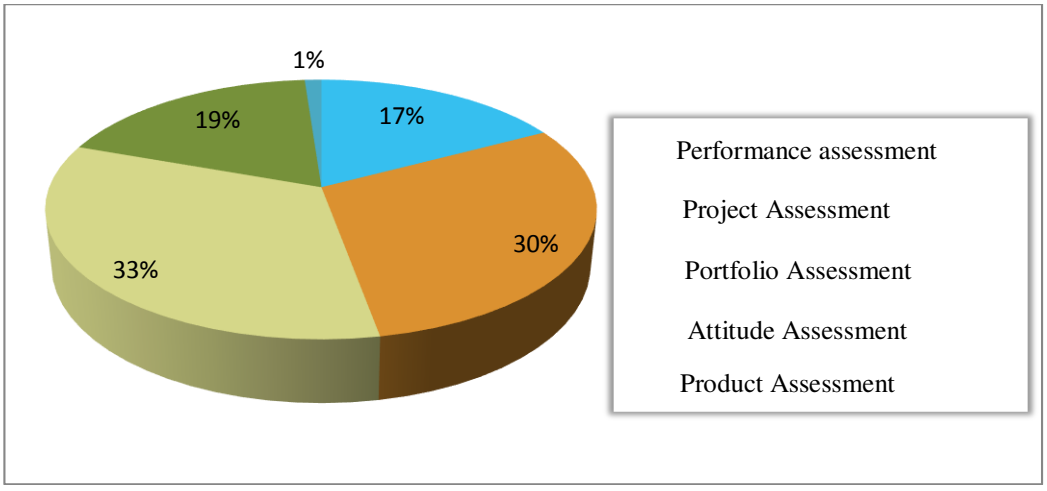

Figure 3. Types of authentic assessment Teachers' understanding of principles of assessment

Based on the result of analysis of the teachers' understanding of authentic assessment the data as shown in Figure 4 below were found.

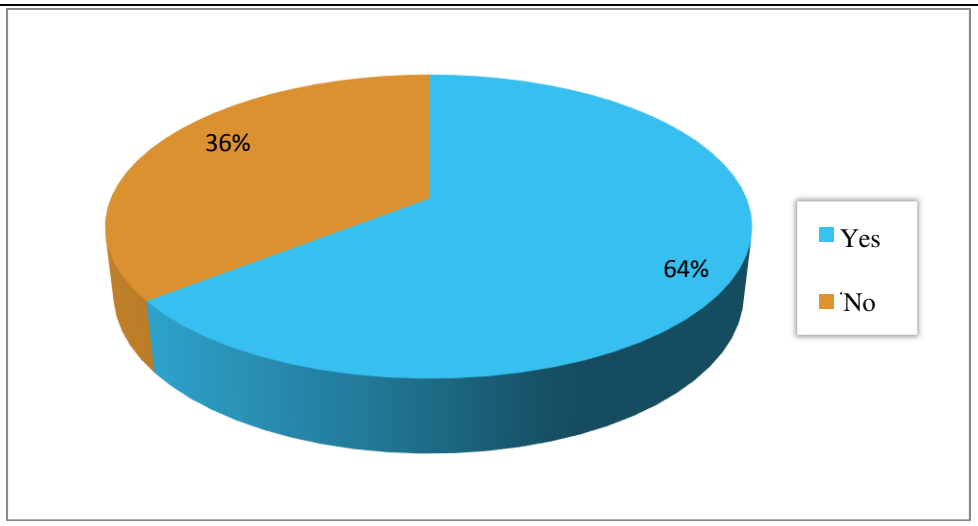

Figure 4. Teachers' understanding of principles of assessment

Based on Figure 4 it is seen that the percentage of teachers who know the principles of assessment is 64%, while the percentage of teachers who do not know the principles of assessment is 36%.

(2) Frequency of teachers in doing authentic assessment in Science teaching

Based on the questionnaire given it was found that the frequency the teachers implement authentic assessment in Science teaching at school is as shown in Figure5 as follows.

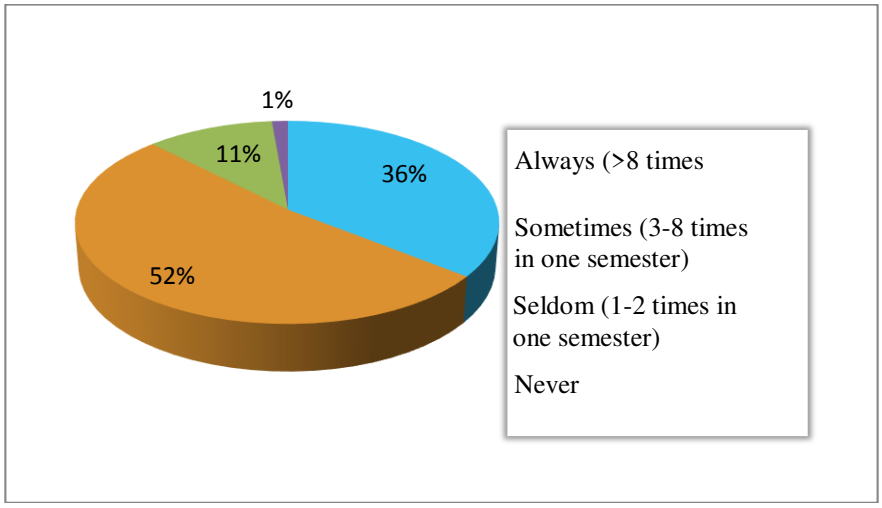

Figure 5. Frequency teachers implement authentic assessment in the classroom

Based on the graph in Fig. 5 above it is seen that 52% other teachers sometimes do it (3 – 8 times in a semester), 36% always do it (> 8 times in a semester), 11% seldom do an authentic assessment (1 – 2 times),and1% say that they never do it.

(3) Leaders' monitoring (Principal and Vice Principal in Charge of Curriculum)

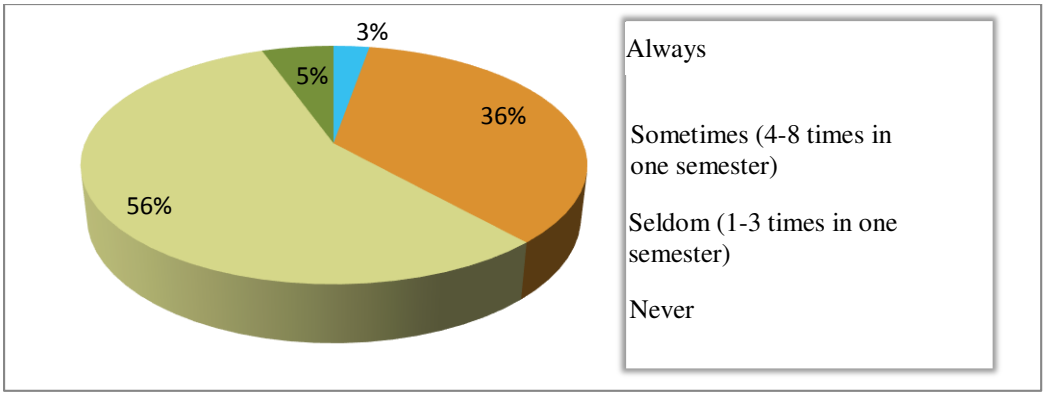

Figure 6. Leader's monitoring frequency (principal, and vice principal in charge of curriculum)

Based on the graph above, it is apparent that the principal and vice principal seldom monitor, the frequency is 56% or the highest, followed by sometimes (36%), and never (5%).These results indicate that the school leaders are not serious in supervising the implementation of authentic assessment at school.

(4) Suggestions made by teachers in relation to authentic assessment in Science teaching in the classroom

The teachers suggested the following in order authentic assessment can be implemented well at school.

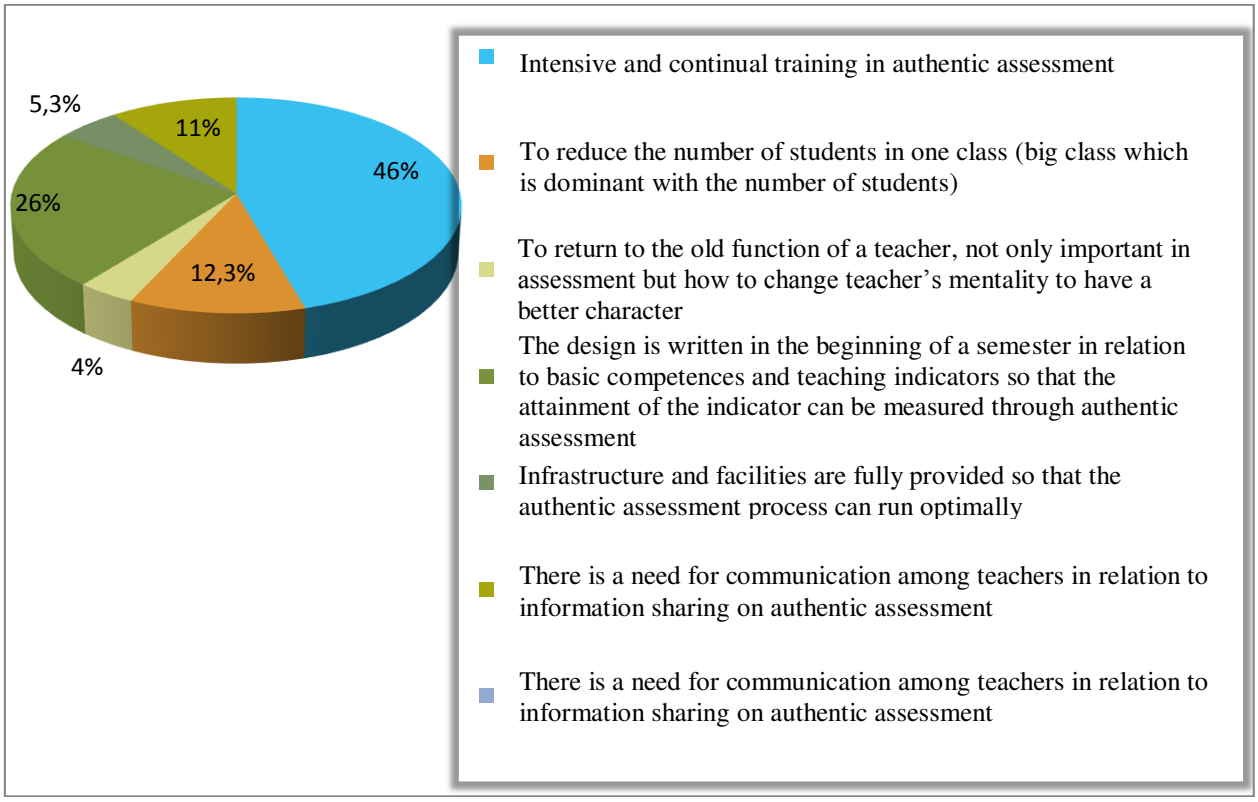

Figure 7. Suggestions made by the teachers in order authentic assessment can be implemented in Science teaching

The suggestions made by the teachers in order for authentic assessment to be implemented well at school are: there is a need to provide training for the teachers of Science especially in relation to designing and implementing

authentic assessment (46%); for teachers to design assessments at the beginning of the semester (26%); to reduce the number of students in one class (<30 students) (12.3%); for the teachers to share experiences among themselves (11%), and to complete facilities especially the ones related to science practicum (5.6%).

3.2 Discussion

The results show that the difficulties faced by Science teachers at junior and senior high schools in designing and implementing authentic assessment in the classroom are caused by some factors. The first factor is the Science teachers' understanding about the nature of science (NOS) which is less than adequate. Only 44% of them understand NOS correctly and the implication on Science teaching. It means 66% of Science teachers have not had correct understandings of NOS. Wenning (2006) states that the nature of science is related to the characteristics of Science such as empirical, creative, imaginative, theoretical, sociocultural contextual, and tentative. Then, Bell (2008) defines science simply, in ontological, logical, epistemological, and axiological terms.The three aspects are 1) ontology, that is science as a field to study its articulation, sociology, and history; 2) epistemology, that is science as a means to obtain understandings, insights, and wisdom; 3) axiology, that is science which stresses more on the benefits of science for the society and the environment. To understand NOS is an important part of science literacy (Cakiki *et al.*, 2012). American Association for the Advancement of Science and National Research Council stress the importance of improving the students' NOS. NOS becomes important because it is needed to make, to manage and to process the objects of science and technology, to inform the decision makers about socioscientific issues, to appreciate the value of science as today's culture, to develop understanding about the norms of the scientific community, to realize moral commitment which contains general values for the community and to facilitate the selection of main topics of science lessons (Hardianty, 2015). The implication of the nature of science is that the Science teachers have to provide learning conditions that make it possible for the students to develop NOS, such as by conducting a research, an inquiry, discussion, to write a scientific paper, and to communicate ideas in speech and writing (Collette & Chiapetta, 1994). It means that if a teacher does not have enough correct understanding about NOS, then he or she will not teach Science according to its nature such as doing a research, making an inquiry, involving in problem-solving, etc. Harlen (1992) states that assessment is an integral part of teaching. Hence, authentic assessment such as performance assessment, presentation, and writing a paper will not be done.

It is something that makes us concerned that 42% Science teachers do not have a correct understanding of authentic assessment, and the rest or 58% of them have a correct understanding.As explained by Kunandar (2013), one of the stresses in the 2013 Curriculum is a shift in assessment, from using a test (to measure cognitive competence based solely on the product), toward authentic assessment (to measure competencies in attitude, skill, and knowledge based on the process and product). Furthermore, it is explained that authentic means a real condition, that is, the ability or skill possessed by the students. For example, the student is given a science project to see his or her competence in applying knowledge that he or she possesses in his or her daily life or the real world. An interesting thing in this study is that although much of the teachers' understanding is not correct about the concept of authentic assessment, the teachers (33% of the teachers) have got a correct understanding about the balance between knowledge, skill, and attitude. This is supported also by the data on the teachers' understanding about the principles of assessment in which 64% of them have understood authentic understanding and the rest (36%) have not understood it. According to Stigins (1994) in order for an assessment can be implemented well, teachers need to be guided by basic principles of assessment. The basic principles are objective, integrated, economical, transparent, accountable, and educative (Kunandar, 2013:51).

The results of this study also showed that the frequency the teachers implement authentic assessment in their classes on the continual basis is only 36%, and the rest or 64% of them do not implement it continually. This is quite consistent with the teachers' understanding of NOS, i.e., 64% of the teachers do not have a correct understanding of NOS. Thus, it can be concluded that the teachers' understanding of NOS and the principles of authentic assessment need to be improved in an effort to improve the students' learning achievement.This result is similar to the finding of Keeratichamroen, *et al.,* (2015) who state that the Science teachers have problems in designing and implementing authentic assessment because of various reasons, such as the heavy load of the teachers besides teaching Science and inadequate time for them to understand authentic assessment and to write the instruments. Suastra *et al.,* (2007) show that teachers of Physics who used authentic assessment in teaching made their teaching more effective than those who used conventional assessment although they all used innovative teaching models. This finding gives support to the importance of the role of authentic assessment in Science teaching to improve the students'

competencies. Authentic assessment, in addition to being able to assess tasks in the students' real life, can also make it effective for the students to learn Science in the classroom (Palm, 2008; Kamen, 1996; Lederman, 2014).

The suggestions made by the teachers to solve the problems that occur in relation to authentic assessment include: the need to conduct training on the continual basis related to the material of teachers' understanding about NOS, authentic assessment, the need to write authentic assessment instruments and to practice the implementation of authentic assessment in the classroom.In addition, the things that need to be given a special attention by the schools and the government are the facilities to support the teaching such as science practicum equipment which needs to be provided in a greater number and in a higher quality. Without adequate laboratory equipment, the teaching of Science as a process cannot be done well. In addition, it is important that the academic supervisor and school principal have to supervise authentic assessment structurally and continually.

4. Conclusion

Authentic assessment is an integral part of Science teaching, but teachers have difficulties in designing and implementing it in the classroom. The teachers have difficulties in designing and implementing authentic assessment because of three factors: limited understanding of NOS and its implication in Science teaching, limited understanding of authentic assessment, limited science laboratory facilities for conducting science in the classroom, and limited good internal and external supervisions from supervisors and academic/ school supervisors. It is recommended to the authorities such as principals, supervisors, office of education and culture at the district up to the central levels to give a special attention, especially by providing training to Science teachers in designing authentic assessment instruments and in implementing them in the classroom. It is also recommended to the Education Quality Assurance Institution and Teachers Education Institution to design programs which can address teachers' problems especially the problems in authentic assessment in Science teaching. There is a need to conduct a further study to see the effectiveness of authentic assessment in Science teaching.

Conflict of interest statement and funding sources
The author(s) declared that (s)he/they have no competing interest. The study was financed by the authors.

Statement of authorship
The author(s) have a responsibility for the conception and design of the study. The author(s) have approved the final article.

Acknowledgments
We would like to thank the DP2M Ristekdikti for this funding assistance through the grant of the graduate team. The author thanks, all supporters at completing this article to be published on science scholar publishing. We are also grateful to International Research Jornal of Management, IT & Social Sciences for publishing our research work in their esteemed Journal.

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